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No. CCX.

NOVEMBER 1, 1881.

Price
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THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

LONDON: HAUGHTON & COMPANY, 10, PATERNOSTER ROW, E.C.

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THE

TELEGRAPHIC JOURNAL

AND

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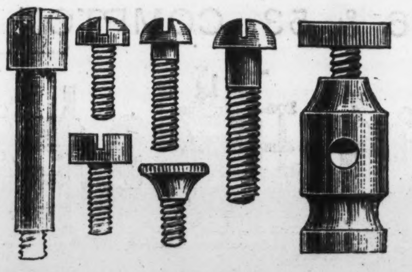

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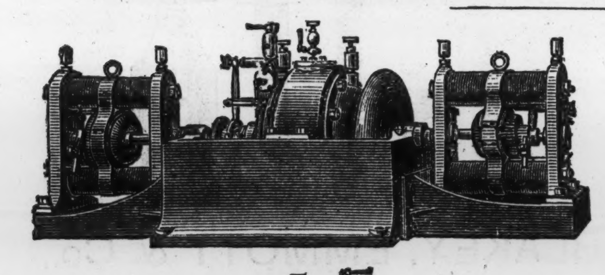

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PATENT 3-CYLINDER ENGINES
AS USED BY
BRUSH, SIEMENS, GRAMME AND WILDE
FOR DRIVING
DYNAMO-ELECTRIC MACHINES

THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

VOL. IX.—No. 210.

THE PARIS ELECTRICAL EXHIBITION.

THE BRITISH SECTION.

THE INDIA-RUBBER, GUTTA-PERCHA AND TELEGRAPH WORKS COMPANY.

THE exhibits of this Company are comprehensive, and consist of a varied assortment of electrical instruments and other objects of interest contributed by the different departments of the Silvertown works; the exhibits of the branch works at Persan-Beaumont, near Paris, are included in the French section.

CABLE DEPARTMENT.

A specimen case contains samples of "deep sea," "intermediate," and "shore end" cables manufactured at the Silvertown works. The total length of telegraphic and torpedo cable made since 1866, amounts to 11931 knots, exclusive of 3180 knots now in course of construction for the Central and South American Telegraph Company; the weights of these cables vary from 24 cwt. to 27 tons per knot.

The 27-ton cable is the heaviest type hitherto constructed at Silvertown, and forms part of the cable laid last year by this company between Grosse Island and the Bird Rocks, in the Gulf of St. Lawrence. On account of the precipitous nature of the Bird Rocks, where the cable is landed, and the danger of the cable becoming jammed by the ice, an exceptionally heavy type has to be used.

The specimens include telegraphic cables made for the British Government and Colonies, India, France, Russia, Peru, Chili, and Japan; there are also torpedo cables, of single, four, and seven core, as supplied to the British Government and Colonies, the United States, Spanish, Dutch, Chinese, and Argentine Governments. Samples of gutta-percha and india-rubber covered wires, of the description which the I. R. G. P. Co. supplies to the British Post-office, the French, and other Governments, for their under-ground systems, are also shown. The form of underground lines adopted in France differs from that of the Post-office in being almost exclusively inclosed in leaden pipes.

"BROOKS' UNDERGROUND MULTIPLE CABLE" system, which has been in successful operation for some years in the United States, and has also been tried by the Post-office with very satisfactory results, has been fully described in the numbers of the Journal for December 1st, 1879, and August 15th, 1881.

A short experimental line of 500 ft., with 28 conductors inclosed in pipes filled with petroleum—with terminal poles and oil reservoir complete—is to be seen fitted up in the Exhibition, the object being to show practically that the system is peculiarly adapted for avoiding inductive disturbances in telephonic circuits.

INSTRUMENT DEPARTMENT.

Amongst the "GALVANOMETERS" are the following:—"Thomson's reflecting astatic galvanometer," complete with shunts, lamp and scale. The four coils in this instrument admit of being coupled up in five different ways so that their total resistance can be made as follows:—1st, All coils in series; 2nd, $\frac{5}{8}$ the total resistance; 3rd, $\frac{1}{4}$ the total resistance; 4th, $\frac{3}{16}$ the total resistance; 5th, $\frac{1}{16}$ the total resistance, the galvanometer leading wires being in each case connected to the same terminals.

"Thomson's reflecting marine galvanometer," complete with shunts, lamp and scale. "Small reflecting galvanometer," with oil vessel, shunts, lamp and scale (Government pattern). "Portable astatic galvanometer," in brass case, with jewelled centres, having 1,000 ohms resistance, in sling leather case, with controlling magnet. "Tangent galvanometer" (Post-office pattern), for testing with received currents, fitted with resistance coil, shunt and short-circuit key. "Speaking galvanometer," for submarine cable work, with lamp, condensing lens and scale stand. "Signalling key," for mirror speaking instrument (Silvertown pattern).

The "RESISTANCE COILS" shown are:—Large set of "Wheatstone bridge resistance coils" (Dial pattern), arranged in units, tens, hundreds and thousands; with proportional parts of 10, 100, 1,000, and 10,000 ohms. Set of "Wheatstone bridge resistance coils" (Post-office pattern), fitted with battery and galvanometer keys, in polished wood case with lock and key.

There are also exhibited "Speaking instruments," "Morse direct ink writers," a "Morse pony sounder instrument" (Post-office pattern), "Morse single current keys" (Post-office pattern), "Bain's fast-speed receiver," for automatic working, fitted with speed regulator, "Wheatstone's A B C instrument (induced magnets), consisting of indicator, communicator and clockwork bell.

Amongst the "RAILWAY SIGNAL INSTRUMENTS are:—"Walker's patent train describer," receiver and sender. By pulling forward a small lever opposite the name to be sent, and pressing back a similar lever at the name last sent, the "sender" attracts attention at the distant station by a single stroke on a bell, and at the same time indicates the name of the coming train on the "receiver," which is provided with a dial labelled to correspond, and a rotating pointer in the centre. "Walker's direct-action semaphore repeater," showing the three positions of the signal arm." Complete set of "Walker's electro-magnetic telegraph semaphores" for railway block signalling. Complete set of "Preece's single wire block signalling instruments," consisting of semaphore, switch and plunger. "Preece's double current light and arm repeater." "Single stroke direct action bell," with key.

There are also shown the "Silvertown water-level indicator and contact-maker," for showing the rise and fall of water in reservoirs at the engineer's office, situated away from the reservoir. "Hall's patent anemometer, with telephone receiver," to indicate audibly at a distance the rate of air passing through underground workings in mines. The anemometer is of the ordinary cup form, and at every revolution causes a spring to vibrate in close proximity to the pole of a Bell telephone. The induced currents thus generated in the telephone coil being transmitted to the distant receiving telephone reproduce on it the sound imparted to the spring every time it is set vibrating. The number of these vibrations, or revolutions, in a given time, is an index of the rate at which the current of air passes through the workings.

A case of specimen "carbon rods," varying from 3 to 25 millimetres in diameter, for electric lamps, is also exhibited.

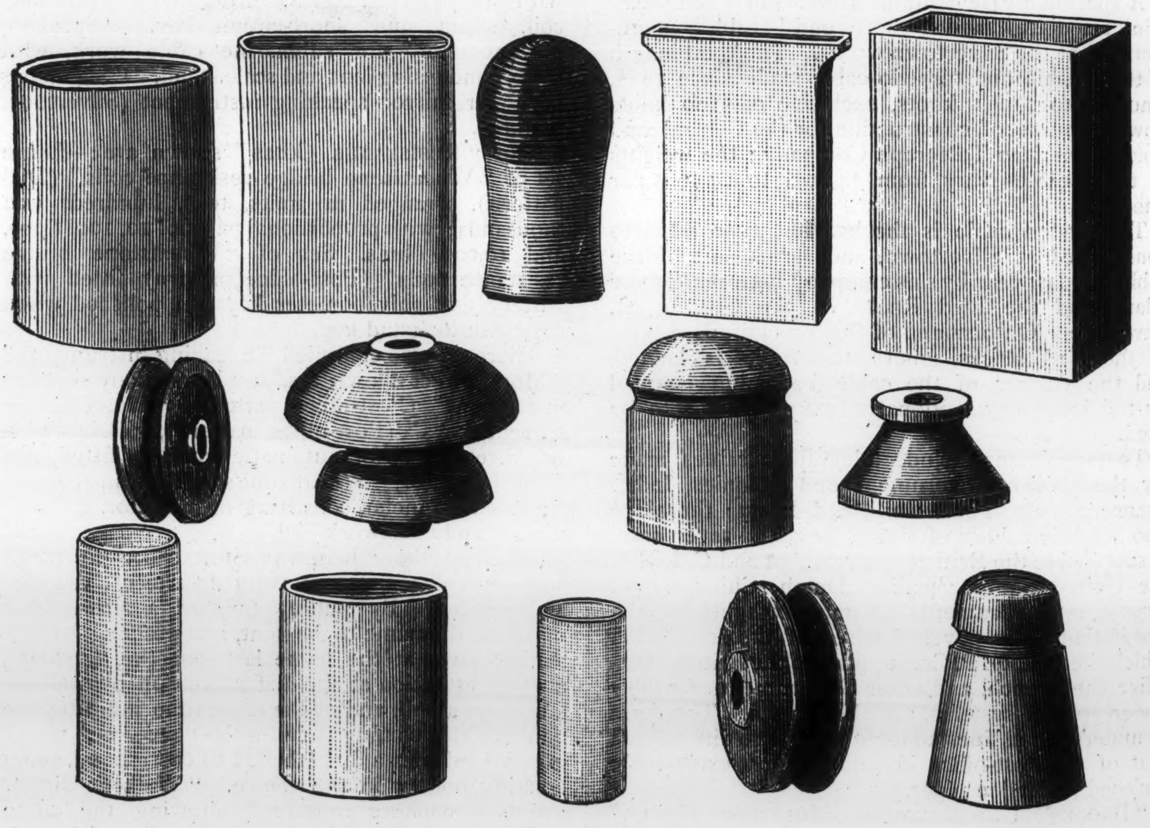
(*To be continued.*)

JAMES STIFF & SONS.

Messrs. Jas. Stiff & Sons, of London Pottery, Lambeth, exhibit a great variety of porous cells and cylinders, both red and white, also porous plates of all sizes. Their porous ware has for many years possessed a high reputation, and has been extensively used by some of the best electricians and telegraphic engineers.

Vitrified stoneware battery jars and telegraph insulators, of all the most usual shapes and sizes are, also exhibited by this firm. These goods have stood the tests to which they have been submitted in the most satisfactory manner. Models of retorts, receivers, acid pans, condensing coils, and other chemical apparatus, in brown and white stoneware, are also shown. Messrs. Stiff & Sons gained prize medals at Paris, in 1878, and at most of the other international exhibitions.

The illustrations which we give show some of the varieties of battery jars, insulators, etc., which are amongst the exhibits.



PHILLIPS BROS.

Messrs. Phillips Bros., of Mackintosh Lane, Homerton, London, exhibit a number of specimens of silk-covered copper wire for electrical purposes. These specimens are remarkable for the uniformity and closeness with which the coverings are laid on, qualities which are very essential for high class electrical instruments. Mr. R. E. Crompton is Messrs. Phillips' Paris agent.

Robey & Co.

The display of steam power by Messrs. Robey & Co., of Lincoln (whose stand adjoins that of the Anglo-American Brush Electric Light Corporation), is very fine. A line of intermediate shafting, placed on columns about 12 feet from the ground, transmits the power from the engines to two long rows of brush dynamo-electric machines.

All the engines are of the well-known patent Robey engine type (*see* Telegraphic Journal, Feb. 15th, 1879), they are seven in number, varying in size from 10 to 40 horse-power nominal, and capable of giving out an aggregate effective power of about 250 horses.

The 40 horse-power engine is at present driving about 40 arc lights, and after careful experiments, extending over the usual evening run of three hours, it was found that the variation from the nominal speed, did not exceed one revolution during the whole of this time; this result being mainly due to the special combination of automatic governor and equilibrium valve used on these engines when employed for electric lighting.

The first three engines in the line of seven are driving on to one length of shafting, the result being that any variation in one engine is absorbed by the other two, and an almost perfect uniform speed is obtained. Thus, if three engines are running at full speed under their usual load, then by slightly turning a nut on the governor-spindle, the work done by any one engine may be doubled, the result being not to increase the speed of the shafting, but to halve the work done by the other two engines so that the total amount of work done remains the same. If, for instance, the three engines are indicating 10 horse-power each, then, by adjusting the governor of the centre engine until a diagram indicates 20 horse-power, it will be found on applying the indicator to the other engines, that they are indicating only five horse-power each, the total power remaining the same.

There are two great advantages in this arrangement, the first being that any slight variation is immediately absorbed, and amounts, in fact, merely to a tendency to variation; the second being that in the event of an accident to the governor, causing the full boiler pressure to be thrown on to the engine, the speed of the shafting remains constant.

The remaining four Robey engines are each driving an independent shaft, which shaft can be coupled up to form one continuous line of shafting when necessary, friction clutches being used for this purpose; by this means any one of these engines can be used for experiment without interfering with the others. All the engines can be coupled together, and any one of them can be stopped independently of the others. It is worthy of observation that these engines are all running very quietly at a moderate speed, and well within their capabilities.

Mr. Killingworth Hedges

Exhibits his electric lamp, which has been specially designed to avoid the complications of the ordinary electric lamp where the regulation is effected by clockwork. In this lamp the carbons are so arranged that they are maintained at the proper distance by the action of gravity alone.

The apparatus used in the connection with the electric lighting of the Liverpool Docks is alone shown. The electric light has been used here for contractors' purposes for five years, and, as a proof of the durability of the generating machines, the same plant is now being used for the permanent illumination of the new docks.

The system employed is that of working a single light from each machine. For purposes where a large area is to be illuminated this is certainly the most economical mode of lighting: for not only is there a loss if the current is divided, but to enable the division to be carried out practically, each lamp must be fitted with a self-acting switch and an equivalent resistance to itself which comes into action if the lamp goes out. The generating machine must also be duplicated in order to provide against any accident to the one at work.

FIG. 1.

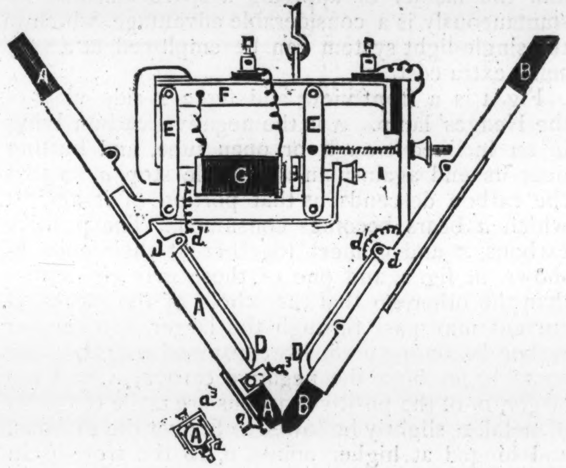
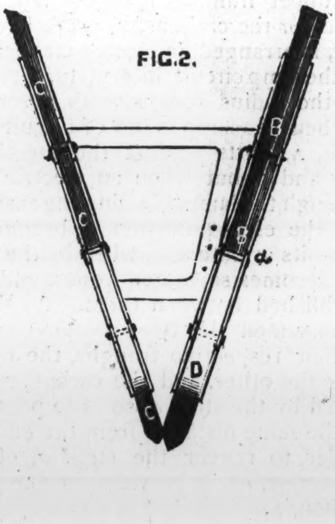


FIG. 2.



The deviator shown by Mr. Hedges provides against an accident to any number of machines working single lights, in the simplest manner. By having one machine running in open circuit, and consequently absorbing only the power required to rotate it, and connecting this to a bar similar to that in an ordinary resistance coil, then by inserting a plug, the spare current can be switched on to either one of the faulty circuits instantaneously.

It is usual to connect either of the circuits to an indicator, which shows a signal and strikes a bell should the current cease, so as to draw the attention of the attendant. Where the electric lighting plant is properly looked after, such a failure is very unusual; however, it is sometimes necessary to stop to adjust the brushes or look to a hot bearing, and the facility of applying a spare machine instantaneously is a considerable advantage, which in the single-light system can be employed at a very small extra cost.

Fig. 1 is a front view, and fig. 2 a side view of the Hedges' lamp. A is the negative carbon lying in an inclined trough or open tube, and butting near its end against an adjustable stop, *a*, so that the carbon descends as that portion of it against which *a* bears becomes consumed. The positive carbons, B and C, meet together at their ends, as shown in fig. 2, and one of these may be smaller than the other, so that the whole of the electrical current may pass through the larger, the smaller carbon becoming gradually consumed with it. The contacts for both the negative carbon, A, and the larger, B, of the positive carbons are made of pieces of metal, D, slightly hollowed to fit over the carbons, and hinged at higher points, *d*, to the troughs in which the carbons lie, the current being led to and from the contact pieces, D, by wires, d^1, escaping the joints of their hinges. The trough in which the carbon, A, lies is suspended by radius rods, E, E, from the upper framing, F, of the lamp to which the troughs for the carbons, B, C, are fixed. In the framing, F, is arranged an electro-magnet, G, having its coil in the lamp circuit, its armature, *g*, is attached to one of the radius rods, E, with a screw adjustment. When the lamp is out of circuit the end of the carbon, A, butts against the meeting of the carbons, B and C, but when an electric current is passed through the lamp, kindling the carbons where they butt, the electro-magnet, G, becomes excited and attracts its armature, *g*, whereby the end of the carbon, A, becomes separated from B and C, and the arc is established between them. As the carbons become consumed the two, B and C, continue to descend their respective troughs, the end of each supporting the other, and the carbon, A, advances, as permitted by the stop, *a*, so as to present its end at nearly the same distance from the ends of B and C. In order to render the stop, *a*, effective, an abutment screw, a^3, is provided at the upper side of the carbon, A.

JAMES FYFE.

Mr. James Fyfe, of 52, Queen Victoria Street, London, exhibits the Pilsen lamp (see *Telegraphic Journal*, December 15th, 1880), and also the Joel incandescence lamp (see *Telegraphic Journal*, November 1st, 1880). The Schuckert dynamo machine (see *Telegraphic Journal*, April 1st, 1879), which is also amongst the apparatus shown, has recently been tested by Mr. Schuckert in Paris with the following results :—

Machine Resistances.	Ohms.	Revolutions per minute.	H.P.	Resistances, Ohms.		Weber.	Volts.	
				External.	Total.		Total.	External.
Ring	5·7	700	5·5	27	40	9	360	243
Magnets	6·6	,,	5·0	30	44	8	351	240
Total Cold ...	12·3	,,	4·5	35	49	7·4	362	259
Warm	14	,,	3·8	40	54	6·5	351	260

At 720 revolutions, 6 Pilsen lamps with arcs 2 to 2·5 mm. wide and 7·5 to 8 Webers of current burn well with 4·5 h.p.

THE BRITISH ASSOCIATION.

ON A NEW SCREW GAUGE FOR ELECTRICAL APPARATUS.

By W. H. PREECE, F.R.S.

(Read before the British Association at York, Sept., 1881.)

IT is very desirable to establish a gauge for the manufacture of various small screws used in the construction of telegraphic and electrical apparatus. Sir Joseph Whitworth, in England, and the Franklin Institute in America, have done this for the bolts and screws used in mill-work and engineering generally, but no one has extended either system to the finer work used in those numerous practical applications of electricity that are now becoming so important. Gauges and screw-plates are now as numerous as the makers engaged in the trade. Nettlefold's sizes of screws are, perhaps, those best known, but they are worked to a special gauge, starting from a diameter of 0·5 inch, which is numbered 32, and which has no known relation to any other gauge used in telegraphy. Whitworth's standard gauge for watch and instrument makers has not yet been adopted. The microscopical gauge is confined entirely to microscopes. There is, in fact, no fixed pitch, no form of thread, no recognised number of threads per inch, no gauge based on practice and experience. Hence inter-changeability for repairs is impossible, and the difficulty of applying for materials from abroad becomes very great. Screws are now generally supplied as "per pattern."

Sir Joseph Whitworth has remedied these defects in the larger forms of machinery, and, at the present moment, there is not a ship in Her Majesty's Navy which is not supplied with the same screws and the same threads. Many large engineering works, such as those at Crewe, are in the same happy condition. Sir

Joseph Whitworth carried his proposed standards for taps and dies to ·100 inch diameter, having 48 threads per inch, but his gauge has not come into general use for sizes less than ·250 inch diameter. I have placed myself in communication with most of the principal electrical apparatus manufacturers in England, and they have not only expressed their willingness to accept a well-conducted gauge, but have concurred in the view I have indicated of the present unsatisfactory condition of the question.

It fortunately happens that, from the point where Sir Joseph Whitworth and the Franklin Institute start in one direction, we can move in the opposite direction, so that, not only can the two gauges be made continuous, but though necessarily different in their applications, they can really be made uniform in their character. Indeed, the Whitworth gauge might itself, with slight modification, be extended.

It is only necessary for us to consider angular threads; square threads do not enter in such small work.

The Whitworth gauge specifies that the pitch of angular threads shall be equal to the depth which involves an angle of 55°, and that the top and bottom shall be rounded off to $\frac{1}{6}$th of the depth.

Screws of a diameter of $\frac{1}{4}$ in. (or No. A in the B.W.G.) have 20 threads to the inch. This is the starting-point of the American gauge, and both deal with increasing diameters. I propose to start from the same point, but to work in the opposite direction, dealing with diminishing diameters. Thus my starting-point is of the new No. 4 centimètre gauge, ·251 in. diameter, having 20 threads to the inch.

The exchange of apparatus between this and continental countries is now so general, that the adoption of the French decimal metrical system is well worth serious consideration. This is felt so much that in nearly every table of wire gauges the dimensions both in parts of inches and metres are given. The adoption of the metre as the unit length would secure adoption of the gauge abroad. The use of the inch as a unit leaves us in that singular insular position to which Sir William Thomson pointedly referred in Section A. the other day.

There are two dimensions besides the form and nomenclature to be considered, viz., the diameter of the screw and the number of threads per unit length. I suggest that the nomenclature be that of the wire gauge. The form I again refer to.

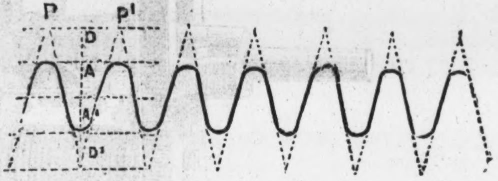
For the first dimension we might adopt a special number, as is done in the trade now, or we may take the same number for the screw and its diameter in *mils* or in millimètres, or, as I propose, we should adopt the new centimètre gauge recommended for adoption by the committee of the Society of Telegraph Engineers (December, 1879).

For the second dimension I propose to take the 5th multiple of the number of the screw in the new centimètre gauge as a factor. Thus No. 5 screw will have 25 threads to the inch, and its diameter will be ·225 in. No. 8 screw will have 40 threads to the inch, and its diameter will be ·161 in., and so on, as shown in the attached table, which embraces nearly all the screws now in use. In all other gauges the number of threads per inch is perfectly arbitrary. In fact, at present, even with the same gauge and the same kind of screw, the number of threads per inch varies.

Thus, if there is any value in my suggestion, we should have a simple nomenclature and a fixed gauge based on that already adopted for wires and plates, and easily remembered.

The attached diagram gives an idea of the character of the thread recommended by me for consideration. It has been carefully prepared with existing threads, and due regard has been paid to the essential requisites of strength, durability, and friction, but in the opinion of some, the depth of the thread is too deep in proportion to the diameter of the screw. In the small screws used for telegraphic and electrical purposes we need not consider the difference of metals employed.

There can be no doubt that a recognised gauge, with a distinctive name, based on a simple method, and easily remembered, and supplied by such a house as that of Whitworth, will soon take root and be generally accepted, if stamped with the requisite authority.



I submit that the subject be referred to a committee of this section for consideration and examination, so that a new gauge may be recommended for adoption, with all the authority of the British Association.

Proposed Telegraph Screw Gauge.

Gauge.	Threads per Inch.		Diameter.	
	Whitworth.	Telegraph.	Inches.	Millimètres.
4	20	20	·252	6·4
5	24	25	·225	5·7
6		30	·201	5·1
7	...	35	·180	4·6
8	32	40	·161	4·1
9	...	45	·144	3·7
10	40	50	·129	3·3
12	48	60	·103	2·6
14	...	70	·082	2·1
16	...	80	·066	1·7
18	...	90	·053	1·34
20	...	100	·042	1·07

A NEW DYNAMO-ELECTRIC MACHINE.

We give an engraving of a new continuous-current dynamo-electric machine, recently perfected by Mr. Clinton M. Ball, of Troy, N.Y. This inventor has been engaged during some years past in building machines similar in type to the alternating current machine of Hefner-Alteneck especially in respect to the absence therein of solid metal parts in the armature, the latter being constituted in the form of a disc composed of a series of coils without iron cores, arranged and adapted to be moved in a magnetic field consisting of a series of poles of alternately opposite polarity on the same side of the disc, and facing opposite sides of the disc.

Mr. Ball has perfected several forms of continuous-current machines of this general type, and from among them we have selected two forms, which we illustrate. These machines have been operated with entire success at Troy; and samples of the machine are either already installed at the Paris Exhibition of Electricity, or are on their way to that destination, forming a part of the joint exhibit made by the "White House Mills" and Mr. Ball.

The bipolar machine, fig. 1, reproduces the effects

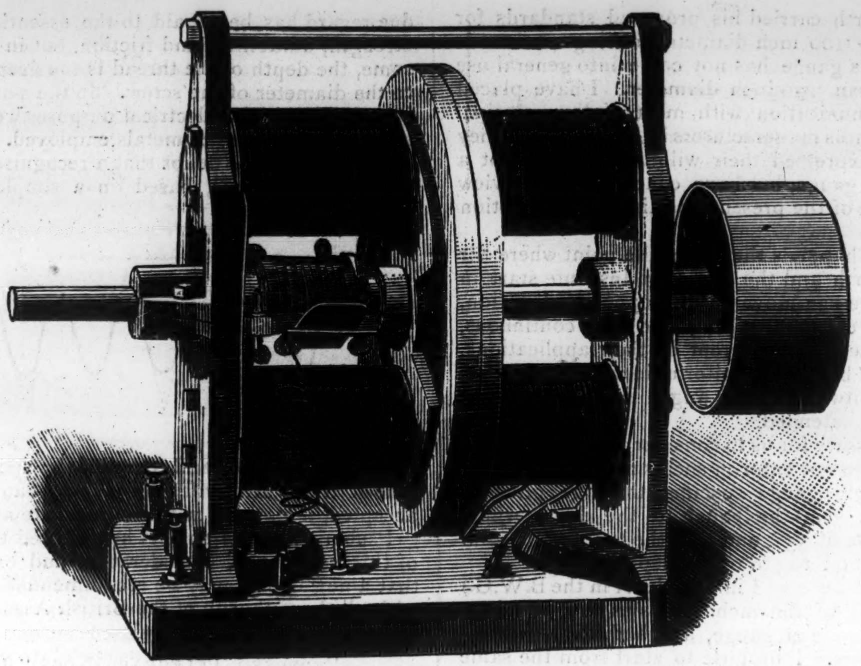


FIG. 1.—BIPOLAR DYNAMO-ELECTRIC MACHINF.

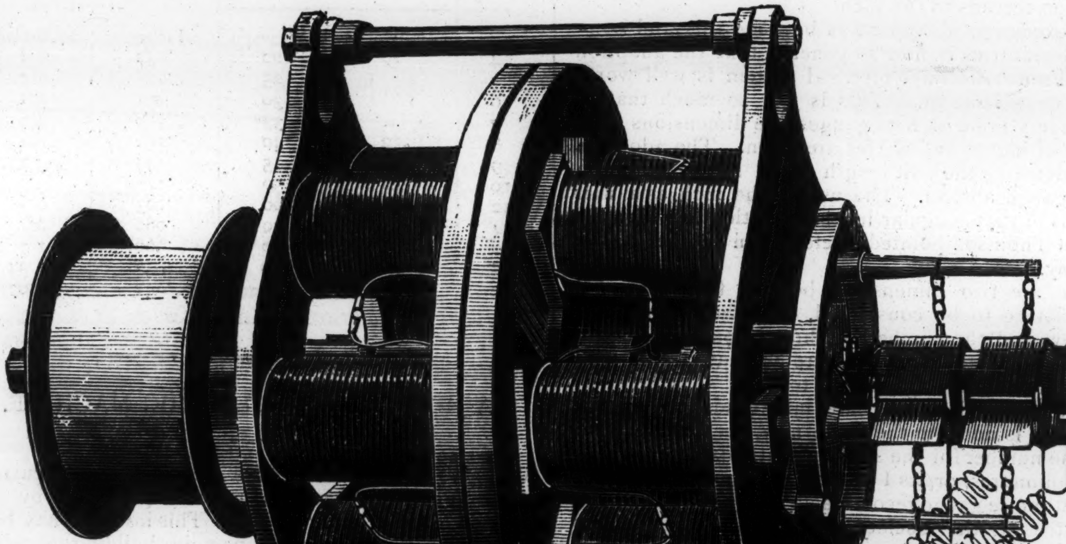


FIG. 2.—COMPOUND MULTIPOLAR CONTINUOUS-CURRENT MACHINE.

of the well-known Gramme machine, over which it possesses important advantages. Its special peculiarities and advantages may be briefly summed up as follows:—The armature is composed of coils, six in number, each of which occupies a sector of the disc of 60°. These coils are made self-supporting in the disc, without iron cores or metallic parts other than the wire of which they are composed, and are connected in a continuous circuit. The commutator plates are six in number, and constitute the terminals of offshoots from the junctions between two contiguous coils. These commutator plates are usually disposed spirally about the axis of the arbor of the machine so as to show at opposite ends an angular displacement from axial parallelism of 30°. From this it results that during rotation a pair of diametrically opposite coils in the armature are bi-circuited during one-twelfth of a revolution at the neutral point of the machine, and this effect recurs successively through the entire series of coils. It will be understood that an important advantage is gained by this arrangement, inasmuch as the resistance of the inactive coils of the armature is thereby eliminated from the internal circuit of the machine. This machine, used as a generator, presents striking and powerful effects with small expenditure of power. It may be used as a very perfect form of an electro-magnet motor. It runs without serious sparking at the commutator, and is simple and compact in construction. A further noticeable feature, which exists furthermore in all machines of this type, is the absence of any noticeable external magnetic field when running.

The other machine, fig. 2, is a compound multipolar continuous-current machine, embodying characteristics of fundamental arrangement which distinguish it from all others; while, as before stated, in some of its theoretical aspects it resembles the machine of Hefner-Alteneck.

The machine represented in the engraving, it will be noticed, has only six opposite pairs of poles in the field system. The continuous-current armature system of the machine has eight elements, and the commutator twenty-four plates. The armature is otherwise composed in two sections or layers, the major section of which is utilised through a commutator or contact rings of ordinary construction for doing work upon the external circuit, while the continuous current section maintains the magnetism of the field.

In this machine, developed and constructed long before the publication of any description of Hefner-Alteneck's machine, the currents are commutated continuously, somewhat as in his machine, the commutator connections being so made that while the contact brushes remain in a fixed position, the currents are brought to them from the consequent electrical poles of the armature—the consequent points, during rotation, assuming successively different positions in relation to the field, and completing the cycle of changes during half of a revolution of the armature. During this time, furthermore, the line bisecting the armature and marking the consequent electrical points, has twice travelled over the complete circuit of the field in advance of rotation. In the case of a machine having more poles in the field than armature elements, the movement of this line would be retrograde; however, if the multiple of half the number of field poles into the number of armature elements remained the same, the number of changes would be the same in either case.

It will be seen that this machine differs from that of Hefner-Alteneck in respect to the proportion of armature elements to the number of poles of the magnetic field—the Ball machine, having a larger number of armature elements than of field poles, while his has a less number. The arrangement selected by Mr. Ball is more favourable to a simplification of details of construction without detriment to the efficiency of the machine.

At a speed of rotation of 9,500 to 1,000 per minute, and with an expenditure of 5½ to 6 horse-power, this machine has proved capable of maintaining a series of ten to twelve arc lights of good power. The machine weighs only 850lbs.—*Scientific American.*

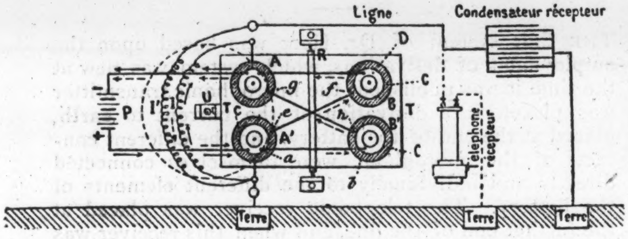
HERZ'S TELEPHONE SYSTEM.

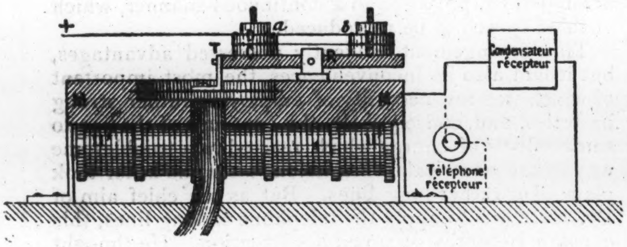
By COMTE TH. DU MONCEL.

THE first system of Dr. Herz was based upon the employment of derivations, which system was new at the time it was published; the microphonic transmitter was placed in a derivation of the current to earth, placed at the end of the battery, and the different contacts of the microphone were themselves connected directly and individually to the different elements of the battery. The telephonic receiver was placed at the further end of the line, and when this receiver was a condenser, its armatures were, in consequence of this arrangement, polarised in a continuous manner, which enabled speech to be reproduced.

This arrangement evidently possessed advantages, but it had also its inconveniences, the most important of which was the necessity of employing rather strong batteries, and, consequently, the exposure of the line to some effects of charge which reacted in a troublesome way in the electrical transmissions when the latter took place over rather long lines. But as the chief aim of Dr. Herz was to apply the telephone to long lines, this question naturally occupied his attention. He thought at first of employing, as in telegraphy, reversed currents; but how was this result to be obtained with systems based on the employment of transmitters actuated by sonorous vibrations? This could be solved by the employment of secondary currents from induction coils, as has been done by MM. Gray, Edison, &c., but then benefit was only derived from the amplifications furnished by the derivations to the variations of pressure in the microphones; he therefore thought to increase the effects of the induced currents themselves by prolonging their duration, or rather by combining them so as to make them follow two by two in the same direction, and the following is the way in which the problem was solved.

It may be recollected that Dr. Herz had, in his first experiments, proved the efficacy of the microphonic contacts obtained by the superposition of discs of carbon or other semi-conducting substances. He employed them with various entirely different groupings, and in general the horizontal arrangement was found to give the best effects. Let us suppose, then, that four systems of contacts of this kind are arranged at the four corners of a plate of ebonite, C, C, as shown in figs. 1 and 2, by A, A′, B, B′, and that they are connected together in the manner shown, that is to say, the upper discs, *e*, *g*, *f*, *h*, parallel to the sides of the plate, and the lower discs, A, A′, B, B′, diagonally. Let us suppose also that the plate can turn round an axis, R, that the discs are traversed by small pins fixed in the plate, and that small discs of lead rest on the upper discs. Finally, let us suppose that the plate is connected at its edge to a telephone diaphragm, by an angle piece, T; it can be at once understood that the vibrations, produced by the diaphragm, will cause the plate, C, C, to oscillate, and that there will result on the part of the discs two effects, which will follow one another. The first effect will be that produced by the ascending vibrations, and will be an increase of pressure effected between the left-hand discs, and produced by their force of inertia augmented by that of the lead discs; the second effect will be that caused by the right-hand discs, and this will be a diminution in the pressures.





If the current of a battery, P, traverses all these discs, by the connections which we have indicated, and passes through the primary coil (by the wire, I,) of an induction bobbin, H, H' (fig. 2), placed beneath the apparatus, and if the secondary current of this bobbin passes, by the wire, I', to the line wire, in which will be interposed a telephone or a speaking condenser, it follows that at the moment of the ascending vibrations, there will be produced an induced current in the reverse direction to that which will instantaneously succeed it, and which being reversed in consequence of the connections of the discs being crossed, will continue the action of the first current or will augment its duration, and, consequently, its power to actuate the telephonic receiver. The results of this system are very good; though Dr. Herz has tried to simplify it. Several arrangements have been tried. For example, in order to obtain the reversal, a contact has simply been placed on each side of the vibrating plate; although, as is well known, the movements of this plate are not of the same nature as ordinary sonorous movements, it was thought that they might be of the reverse kind on the two sides of the plate, and that one of the contacts would be compressed whilst the other would be expanded. This arrangement, otherwise advantageous, necessitated the plate being placed vertically, so that the same adjustment could be given to the two contacts which ought to be identical. It was difficult to regulate by weights, and even to obtain adjustment it was necessary eventually to employ two parallel diaphragms, vibrating in unison and each carrying a contact, but in opposite ways. The horizontal arrangement was reverted to; but by a convenient combination, the two principles of Dr. Herz, viz., derivation and inversion, are combined. The current is then varied by a double contact where it divides, and this contact is arranged beneath a plate, so that its two points of variable resistance act in a reverse way as regards each other, or only (in some apparatus) so that one of the points has no variation whilst the other acts. It is easy to understand the effect that would be produced. The system has, moreover, been experimented with under various forms; sometimes the derivation is simple, that is to say, only one of the currents is sent to line; sometimes it is double, each of the branches being furnished with a bobbin, and communicating with the receiver. In this case the result is remarkably good, but the apparatus is rather complicated; it requires, amongst other things, great care in construction, experiment having shown that the induction bobbins should not be equal, but that they should have resistances arranged according to the circuit served.

It must be added that the researches are being continued in order to determine which are the proper substances to employ as contacts for the microphones. The number of these bodies which have been tried is very large, and the important result has been arrived at, that the number of substances which can be employed is almost innumerable. The contacts in the Herz apparatus have been made with conducting substances (metal for example) reduced to powder and agglomerated, by chemical means, with a kind of non-conducting cement. The proportion of the combination of the substances depends upon the conductibility of the materials employed, and it alone determines the microphonic value of the composition; the nature of these elements appears to exercise scarcely any influence.

The speaking condenser has not been neglected, if it is useful to obviate the effects of induction. For this purpose experiments have been made to determine a convenient arrangement of the same and a regular mode of construction, the good working of this piece of apparatus being absolutely dependent upon the care with which it is set up.

According to M. Herz, the telephone should not remain an instrument which has variations in form merely; it ought, on the contrary, to be modified according to circumstances. He thinks that a telephone working to a long distance should differ from a telephone for town work only, that an apparatus made to transmit singing should not be the same as one to transmit speech; also that various types should be assigned to various purposes.—*La Lumière Electrique.*

ELECTRICAL EXHIBITION AT THE CRYSTAL PALACE.

THE Lord Mayor presided, on the afternoon of the 24th October, at a meeting at the Mansion House to consider the propriety of holding an Electrical Exhibition at the Crystal Palace similar to that now being held in Paris.

Mr. McGeorge, chairman of the Crystal Palace Company, moved that the following gentlemen, with power to add to their number, be constituted an honorary council of advice :—The Lord Mayor, Mr. J. Abernethy (President Institute Civil Engineers), Professor W. Grylls Adams, Sir James Anderson, Mr. E. J. Ashby, Professor W. E. Ayrton, Lieut. Colonel T. U. Bateman-Champain, Colonel Beaumont, Mr. J. T. Bedford, Sir Henry Cole, Mr. W. Crookes, Mr. S. T. Day, Mr. Alderman Ellis (Lord Mayor Elect), Mr. H. G. Erichsen, Mr. H. C. Ford, Captain Douglas Galton, Dr. Gladstone, Colonel Gourard, Mr. W. Grantham, Mr. C. Gregory, Mr. Alderman and Sheriff Hanson, Sir J. Hawkshaw, Mr. John Holmes, M.P., Dr. J. Hopkinson, Admiral Sir

E. A. Inglefield, Professor Fleeming Jenkin, Mr. P. De Keyser, Mr. Laing, M.P., Mr. Sheriff Ogg, Sir Arthur J. Otway, M.P., Sir E. J. Reed, M.P., Mr. Samuelson, M.P., Colonel Sir Herbert Sandford, Mr. J. S. Sellon, Dr. C. W. Siemens, Mr. W. Spottiswoode (President Royal Society), Sir Henry Tyler, M.P., Mr. C. V. Walker, Mr. T. Waller, Sir E. Watkin, M.P., Mr. Pender, M.P., Mr. Hyde Clarke, and Sir John Bennett. —Mr. McGeorge stated that no guarantee fund would be required, but it was thought that from the great public interest attached to the subject, and the great public advantages likely to accrue, the City companies and the public generally might be appealed to for the purpose of providing gold medals as awards to the exhibitors. The jurors would be composed of gentlemen of the highest possible standing, who had at heart the progress of electricity.

Mr. C. Schiff, one of the Crystal Palace directors, seconded the motion, and it was carried unanimously.

Major Flood Page explained that the directors of the Crystal Palace, being anxious to do all in their power to promote technical education on the lines of the Great Exhibition of 1851, to which the Crystal Palace owes its origin, and having regard to the strong interest excited in the scientific and commercial worlds, and in the mind of the public generally, by the rapid advances recently made in the application of electricity, had decided that the second of the series of international exhibitions, inaugurated in June last by his Royal Highness the Duke of Connaught, should be an Electric Exhibition. With this view, communications had been opened with the leading exhibitors at the Electric Exhibition in Paris, and with others who have made the development of electricity their special study. Although but a very short period had elapsed since the first steps were taken, the responses had been such as to render it certain that an effective and varied display would be made at the Crystal Palace. Most of the best known systems of electric lighting would be represented; and various new lamps would be exhibited for the first time in public. The storage of electricity, would, it was hoped, be illustrated by Faure's and De Meritens' secondary batteries. Telephones, which were not nearly so much used in England as elsewhere, would be strongly represented; and the various applications of electricity as a motive power would be seen in Trouvé's boats and other interesting exhibits. Many eminent scientific men had expressed great interest in the undertaking, and intend to become exhibitors. The directors hoped, with the help of the Honorary Council, to make the forthcoming exhibition valuable to manufacturers, railway and dock companies, and others who are thinking of applying electricity to their various undertakings, and the most interesting of the kind to the general public that has ever taken place in England. It was proposed to open the Exhibition in December next, and that it should continue open for some months. Exhibitors would be received on and after 21st November. Exhibitors would not have to pay any rent, but they would, at their own expense, place and decorate their exhibits. Engine power would be found for those exhibitors of electric light who applied for it, so far as the arrangements would admit. He hoped that the Government would see their way to giving the Exhibition both their countenance and support. It was of great importance that they should do so—(hear, hear).

Mr. J. Holms, M.P., moved—"The Honorary Council having heard a report from the directors of the Crystal Palace with reference to the International Electric Exhibition—being the second of the series of international exhibitions inaugurated in June last by his Royal Highness the Duke of Connaught—cordially approves of the Electric Exhibition, believing that it will promote the development of electricity in its application to science and commerce, and will at the same time be interesting to the public." The hon. gentleman expressed his belief that the proposed exhibition would prove of great benefit to the country at large.

Colonel Gouraud seconded the proposition, and expressed the hope that, on account of England's nearer proximity to America than America to France, and also from the language of the two countries being identical, Americans would exhibit in greater numbers than at the Paris Exhibition. He said Mr. Johnson (Mr. Edison's agent) had arrived in London with a larger collection of Mr. Edison's inventions than that now shown in Paris, and would exhibit it at the proposed exhibition at Sydenham.

The proposition was supported by Captain Galton and Sir J. Anderson, and carried with unanimity.

Major Flood Page having explained that M. Cochery had promised that the French Telegraph Department will exhibit if the British Telegraph Department is also to be represented, and having also cited various cases to prove the value, of such an exhibition as that proposed, to the commercial public, on the motion of Mr. McGeorge seconded by Sir John Bennett, the Lord Mayor was thanked for the practical interest he had displayed in this and other similar movements.

The Lord Mayor expressed the pleasure it had given him to place the Mansion House at the disposal of the promoters of the exhibition. He trusted it would be a success, and he believed it would be. So far as he was concerned, any assistance in his power would be gladly given. He did not believe that the proposed exhibition, coming so soon after the Paris Exhibition, would be injured thereby. On the contrary, he believed that the Paris Exhibition had excited a public interest on the subject which would be of benefit to the one about to be held at the Crystal Palace—(hear, hear). As for Government support, he had no doubt that they would be successful in getting it. He saw no reason why the Postmaster-General, who lent his aid to the Paris Exhibition, would not do the same with regard to the one now under consideration, and he believed Mr. Fawcett would do so—(applause). He also thought that they had excellent grounds for making an appeal to the public for the means of providing gold medals, and he was satisfied that such an appeal would be successful—(applause).

The meeting then broke up.

[Having attended this meeting, we are glad to be able to state that there is every probability of the above Exhibition being a great success, and we strongly advise those of our readers who have apparatus to exhibit to apply at once for space.—ED. *Tel. Jour.*]

Reviews.

Electric Lighting by Incandescence, and its application to interior illumination. BY WILLIAM EDWARD SAWYER. New York: D. Van Nostrand. London: E. and F. N. Spon, Charing Cross.

THERE is at present good reason to suppose that electric lighting by incandescence will come into very extensive use. Should the installation of the Swan system at the Savoy Theatre prove a success, as there is every likelihood of its doing, a very great impetus will be given to the future development of the method of lighting. Edison is undoubtedly the pioneer of a successful incandescence system, although to Mr. Swan belongs the credit of having originated the "incandescent carbon loop," which is employed in some form or other in almost every lamp of the kind yet devised. The fact that Swan, some 20 years ago, devised an incandescence lamp with a thin carbon loop is now very generally known, although Mr. Sawyer, in the historical summary in his book, does not mention it; this however may have been due to inadvertence, as the work in question is practically a description of the systems and principles with which Mr. Sawyer is acquainted. To do Mr. Sawyer justice, he certainly has endeavoured to give full information on the subject, and, moreover (as he states in the preface), he has sought less to indicate defects, than to exhibit accomplishments. The first three chapters in Mr. Sawyer's book are devoted to short descriptions of the various dynamo machines now generally known; amongst others, a machine invented by the author is explained; the principle of this apparatus is that of changing the magnetic power of the soft iron core in a bobbin by bringing a large mass of soft iron near the core, the currents, in fact, are generated in the machine by the rotation of a soft iron wheel with projecting spokes, the bobbins remaining stationary; this machine is, however, stated not to be particularly effective. A modification by the author of the Siemens' machine is also described: its principal object is to reduce the heating which takes place in the ordinary form of machine; this is effected by keeping water circulating in the armature, a device which experiments proved to be quite efficacious.

The chapter on "Carbons for incandescent lighting" contains much useful information on the subject; the whole question of carbons generally, is of such great importance that it requires much more attention than has yet been paid to it. To obtain really good carbons for arc lighting, the manufacture requires, we consider, to be as perfect as for the finest porcelain, indeed it is a subject which porcelain manufacturers might turn their attention to with great advantage.

Mr. Sawyer, in describing his own incandescent lamps, naturally does so at a considerable length; but although various modifications of the same have been made, the latest or "perfected" form does not seem altogether to be a very happy idea, more especially when it comes to be compared with the far simpler inventions of Edison and Swan; no doubt, however, it would work well.

The chapter on the "Division of current and light" is of a rather elementary character, although what information there is, is dealt with in a practical manner. The concluding chapters have reference to "Regulators and Switches," "General Distribution," and "Commercial Aspects," the latter being from an American point of view, *i.e.*, in making comparisons American prices are taken.

Although no doubt there is a considerable amount of information in the work, one of its principal objects is undoubtedly to bring out the Sawyer system as prominently as possible.

Johnston's Illustrations of the Electro-Deposition of Metals. By W. & A. K. JOHNSTON. Edinburgh and London.

THESE diagrams, which form part of the series dealing with electrical science, are very suitable for class instruction, being distinctly and boldly drawn and coloured. The small explanatory handbook, which is written by Mr. Alexander Watt, is well suited for its purpose.

English-French Technical Vocabulary, for Scientific, Technical, and Industrial Students. By Dr. F. J. WERSHOVEN. Libraire Hachette & Cie., 18, King William Street, Strand, London.

THE title of this book explains its contents. It is a most useful work, and no one who is engaged in making translations of, or reading, French scientific works should be without it. It has well supplied a real want.

Correspondence.

CITY AND GUILDS OF LONDON INSTITUTE EXAMINATIONS.

To the Editor of THE TELEGRAPHIC JOURNAL.

SIR,—I was glad to read the letters from "A Student" and "W. M. M." which have recently appeared in your Journal. As a teacher under the City Guilds, I can endorse much that has been stated on the subject of the recent examinations which have proved so discouraging both to pupils and teachers; as a consequence many are deterred from joining the classes, knowing the odds against them.

During last session I taught a class (under the Science and Art Department) consisting of students, strangers to the subject, but succeeded in passing 95 per cent. 1st class.

During the same session I taught one under the City Guilds, in a branch of industry in which the students had all served some years and all were possessed of a good education; in spite of this, only about "25 per cent." succeeded in taking 2nd class elementary certificates. In consequence of this, they and others are deterred from any further attempt, and the class falls through. If *all* the pupils succeeded in passing, the remuneration to teachers is small, seeing the classes are limited to those actually engaged in the industry to which the examination refers. But, when the successes are so small as at present, owing to the high standard required, I would ask where is the remuneration for seven months' work to come from?

I agree with "W. M. M." that the practice of giving ten questions and expecting all to be answered is too much for three hours, and especially when some of the questions are not on subjects included in the syllabus, which at best is a very vague guide for the teacher. I would ask with "A Student" why the syllabus is not arranged to suit each grade, the same as that issued by the Science and Art Department?

Yours truly,

A TEACHER.

[A subscriber, who gives no name or address, writes to us with reference to the latest form of the "Brush Dynamo Machine." We are informed that the apparatus has undergone no essential change since the time when we published an account of it in the Journal. (*See* TELEGRAPHIC JOURNAL, Jan. 15th, 1879).—ED. TEL. JOUR.]

Notes.

TO OUR READERS.

ON account of the extreme pressure on our space, it has been decided to issue, on Saturday, the 5th November, an extra supplemental number of THE TELEGRAPHIC JOURNAL. This issue will consist chiefly of notices of British and foreign exhibits at the Electrical Exhibition now being held at Paris, and we think will prove of considerable value to our readers, all of whom, almost without exception, are more or less directly interested in those exhibits. Subscribers will receive this extra number by post as usual.

HEMIHEDRAL CRYSTALS WITH INCLINED PLANES AS CONSTANT SOURCES OF ELECTRICITY.—By MM. Jacques and Pierre Curie.—A section suitably cut from a hemihedral crystal with inclined planes, and laid between two leaves of tin forms a condenser which becomes charged spontaneously on compression. In this manner a new instrument may be obtained, that is, a condenser having special properties. These properties follow from the laws which we have formerly established for the liberation of electricity in hemihedral crystals. We will now show how this instrument may serve as a standard of static electricity for the measurement of charges or capacities. We shall also give an absolute measurement of the quantities of electricity disengaged by tourmaline and quartz at a given pressure.

It is necessary to call to mind three of the fundamental properties which are possessed by a crystal acting as a condenser-source: 1, the two planes are charged with quantities of electricity exactly equal and of contrary signs; 2, when one of the phases is in communication with the earth the other furnishes a given quantity of electricity for a given pressure; 3, the quantity of electricity evolved and the pressure exerted are proportional.

From these propositions it follows that whilst a battery enables us to bring a conductor to a given potential, a condenser-source will furnish a conductor with a determinate quantity of electricity; further, this quantity may be selected beforehand above a certain magnitude.

The quantity of electricity developed by a weight of 1 kilo. placed upon a tourmaline is capable of raising a sphere of 14.2 c.m. to the potential of 1 Daniell. The quantity of electricity disengaged by 1 kilo. upon a plate of quartz perpendicular to a horizontal axis is capable of raising a sphere of 16.6 c.m. to the potential of one Daniell. These numbers measure what may be called the electric powers of the pressure of tourmaline and quartz. The absolute measures have been made with the aid of an apparatus which applied the pressure directly to the crystal. But when it is desired to employ the crystal as a source of electricity it is more convenient to apply the pressure by means of a lever, keeping it all the time in a dry enclosure. It is better not to be concerned about the arms of the lever, and to determine directly, once for all, the quantity of electricity liberated for a weight of 1 kilo. placed at the end of the lever. If the crystal is never displaced it may serve as a standard.

The following method will serve in all cases for finding the quantity of electricity set free: the needle of a Thomson-Mascart electrometer being charged by means of a battery, one of the tin-foils of the crystal is connected with the earth, and the other with one of the couples of sections of the electrometer, and at the same time with a conductor of known capacity. This totality of conductors being insulated, the other couple of sections of the electrometer are placed in communication with one of the poles of a Daniell's element, the other pole being connected with the ground. The needle of the electrometer deviates, and weights acting upon the crystal are added until the needle is brought back to zero. This operation is conducted like an ordinary weighing, by adding or removing weights, the quantity of electricity disengaged depending only on the final pressure.

The tin-foil of the conductor-source, the standard of capacity, and the sectors of the electrometer are then at the potential of 1 Daniell, and the weight which is required for this purpose is known. The same operation is repeated after having suppressed the standard of capacity. The difference of the weights obtained in the first and second case represents the weight necessary to raise the standard of capacity to 1 Daniell.

The method which we are about to describe includes in itself a process for the comparison of capacities. We may, in fact, determine by means of three weighings, the quantities of electricity needful for raising two conductors to the same potential, whence the ratio of their capacities may be inferred.

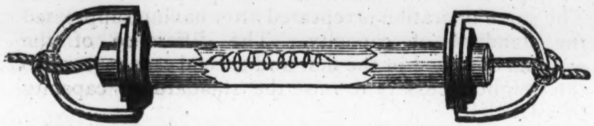
On the contrary, by charging the two sectors with two different elements, and finding the weights necessary for bringing one and the same capacity to the same potential, we have the ratio of the electrometer forces of the two elements.

Finally, we may measure a charge with great precision, the body charged being placed in connection with the condenser-source, and with any electrometer, the latter shows the presence of electricity, and is brought back to zero by placing weights upon the condenser.

These methods have the advantage of always bringing back the electrometer to zero. It serves. therefore, merely as an electroscope, and a greater sensitiveness may be employed. The determination of capacities and that of charges is effected thus with precision. The apparatus may also serve for maintaining at the same potential a body which constantly loses electricity, and which must remain insulated.

The constants of a condenser-source are: 1, the quantity of electricity disengaged by a weight of 1 kilo. at the end of the lever; 2, its capacity. To charge bodies of very small capacity, it is advantageous to have a condenser-source of very feeble capacity; a tourmaline or quartz of 0.01 metre in height, and of a few square millimetres of surface cannot reach the capacity of a sphere of 0.01 metre radius and furnish quantities of electricity capable of charging a sphere of 3 metres radius to the potential of 1 Daniell. To charge bodies of a rather greater capacity, there is no great inconvenience in augmenting the capacity of the condenser-source, and it may be obtained by making the quantities of electricity much more considerable. We have constructed a battery of 9 plates of quartz, cut parallel to each other, and perpendicular to a horizontal axis in one and the same specimen of homogeneous quartz. Each plate has about 20 square centimetres of surface. They are placed one upon another, separated by sheets of tin-foil, all those of even numbers being folded back. It results from this arrangement, that on a variation of pressure exerted upon the pile, all the tin-foils of the even numbers are charged with one electricity, whilst those of uneven numbers are charged with the other. By connecting on the one hand all the tin-foils of the even numbers, and on the other hand all those of the uneven, we have a condenser-source, the capacity of which is that of a sphere of 3.5 metres radius. It easily furnishes wherewithal to charge $\frac{1}{10}$ microfarad to the potential of a Daniell.—*Comptes Rendus.*

Moore's Double Swivelled Disconnecting Electric Wire Tube.—The object of this invention is the attachment of telegraph wires to swivels, and to allow of the cables revolving without cutting off electric communication. The cables, made smooth where they enter, are fastened to the swivels in any manner desired, and then passed through a stuffing box at the shoulder end of the tubes. On leaving the stuffing boxes and entering the tubes, the cables are stripped of their outer coating. One wire is made spiral and the other straight, the latter revolving inside of the former, both wires being detached when in the tube. These swivelled tubes may be applied to cables on board of, or suspended from, vessels; or to cables on the bottom of rivers or seas. By the tubes turning with winds or tides they prevent cables from kinking, and also lessen the strain on the wires. The tubes may also be applied to disconnect land wires underground or overhead.



Telegraphic Communication with Lighthouses.—The Lord Mayor presided on the 19 ult. at a meeting in the Mansion House to consider the need of establishing telegraphic communication between lighthouses and light-ships and the shores, with a view to prevent as much as possible loss of life from shipwrecks on the coasts of the United Kingdom. The attendance was not very large.

The Lord Mayor, in opening the proceedings, said he had great pleasure in granting the use of the Egyptian Hall for such a meeting as this. A requisition had been addressed to him signed by, he thought, 1204 gentlemen, requesting him to call a meeting for the purpose of promoting as far as possible telegraphic communication between lighthouses and lightships and the shore. Considering that this was a matter not of local interest alone, but of national interest and importance, he felt bound to do his utmost to forward the object of the meeting. Now that we had telegraphic communication all over the country, and indeed over all parts of the world, it was only fair and right that those who were obliged to spend much of their time in lighthouses on our coasts should have opportunities of having communication with the shore. A great many of the lightships and lighthouses around our coasts were built near quicksands or were built on rocks, and some of them were as far away from the shore as ten, twelve, and fifteen miles. He could conceive nothing more uncomfortable than the position of the watchers in those places without any proper means of communication between themselves and the shore. Guns and rockets answered, perhaps, well enough in fine weather, but they were of little or no use in snowstorms, and during such gales as that which prevailed last Friday. He believed telegraphic communication with those places and the land would be the means of saving not alone a large amount of property, but many valuable lives during every year. The object of the meeting was to provide such a means of communication. To that end it was proposed that the Government should be asked to establish telegraphic communication between our lightships and lighthouses and the shore. The Government might take up—and ought to take up—such a matter as this. The question for the consideration of which the meeting had been called was one of national importance. He hoped, therefore, that the Government would see their way to take up the matter and comply with the request of the meeting —(hear, and applause).

Mr. J. Hobbs, the principal promoter of the meeting, moved:—"That, in the opinion of this meeting, it is a matter of urgent necessity that electric communication should be established between the various lighthouses, light vessels, and the shore, in order that more speedy intimations of vessels wrecked and life and property in peril may be afforded to those ready to come to the rescue."

Mr. A. Shippey, the inventor of the signal balloon, seconded the proposition, and it was carried with unanimity.

Mr. W. H. Lefevre moved a resolution requesting the Lord Mayor to forward the resolutions of the meeting to Mr. Gladstone, with a prayer that the Government should take some immediate practical steps to carry out and to effect such requisite communication, and that the result of such requisition be published.

Mr. G. Nelson (Margate), seconded the motion, which was also carried unanimously.

A vote of thanks to the Lord Mayor concluded the proceedings.

The Electric Light and Power Generator Company, Limited.—An extraordinary general meeting of the members of the Electric Light and Power Generator Company (at which Admiral Sir E. A. Inglefield presided) was held, on October 26th, at the Cannon Street Hotel, for the purpose of considering certain agreements which had been provisionally entered into respecting the purchase of the Maxim Incandescent Light. The price to be paid for it was £54,000, of which £12,500 could be paid in shares. This included all rights in India, America, and the British Colonies, with the exception of Canada. The motion, having been adopted, the chairman invited the shareholders to inspect the Maxim lamp at its present stage of development.

The Paris Electrical Exhibition.—Sir Charles T. Bright writes to the London papers that he is informed officially that this Exhibition will close on November the 17th.

A Long Span.—The longest span of telegraph wire in the world is stretched across the Kistnah River from hill to hill, each hill being 1,200 feet high, between Bezorah and Sectanagrum, in India. The span is a little over 6,000 feet in length. The only mechanical contrivance used in stretching this cable across the river was a common windlass.

The Orkney and Shetland Telegraph Cable.—The *Dacia*, which has now been engaged for some weeks in the work of getting up old telegraph cables lying submerged between Orkney and Shetland, has returned to Shetland, after successfully recovering the second cable. The weather, however, is so stormy that it may be a considerable time before anything can be done towards submerging the new cable. On a former occasion a steamer lay for months in the islands without a single day on which these stormy seas could be got over and a cable laid, and the Shetlanders are now afraid that a similar thing may occur.

The Jersey Cable.—The cable between Dartmouth and Jersey is interrupted. The fault is believed to be close to Dartmouth.

THE ELECTRIC LIGHT IN WESTMINSTER.—The *Westminster and Chelsea News* says that the Westminster District Board of Works have resolved to obtain tenders from the Electric Lighting Companies to ascertain the cost of lighting Parliament Street, the Broad Sanctuary, and Victoria Street, by this system of lighting.

ELECTRIC LIGHTING IN RAILWAY TRAINS.—The first application of electricity to the lighting of railway carriages has been made in one of the Pullman cars on the London and Brighton Railway. The car was filled with eight of Swan's incandescent lamps, which were supplied with electricity from one of Faure's accumulators. The trial was perfectly successful, the clearness and steadiness of the light being quite unaffected by the motion of the train.

CONSTANT GALVANIC ACTION.—Prof. Exner, of Vienna, has lately proved that galvanic elements formed of three elementary substances, one of which is bromine or iodine, give perfectly constant action, and that the electromotive forces exactly correspond to the heat values of the chemical processes. There is no trace of polarisation. Bromine and iodine are also shown to be the worst conductors of electricity at present known. Both bromine and iodine conduct entirely without polarisation (the latter in solid as well as in liquid condition). The conductivity rises rapidly with the temperature.—*Nature*.

CHESTERFIELD AND THE ELECTRIC LIGHT.—Chesterfield, which at night for some weeks has been in a state of total darkness, has decided to light up with the Brush electric light. It is calculated that the large town can be lighted by 34 2,000 candle-power Brush lights, which cover the ground at present occupied by 170 gas lamps, the remainder of the lighting to be done by 36 "Orion" lamps. The capital expenditure for dynamo machines, lamps, driving power, &c., comes to £2,700, and the annual cost of running the same is set down at £550, which includes all the working expenses, the only additional annual charge being that in respect of interest and depreciation, which is set down by the Chesterfield authorities at £250.

THE OXY-HYDROGEN LIGHT BY ELECTRICITY.—Professor Blyth, in the course of some remarks made at the opening of the evening science lectures at Anderson's College, Glasgow, said: "The electric light had so dazzled our eyes and filled our heads that there seemed to be little room left for seeing or considering other methods of converting mechanical work into heat and light through the agency of the electrical current. One such method in particular had been very strangely ignored—the method of lighting by the oxy-hydrogen light, where the gases are supplied by electrolysis. There seems to be no reason why our waterfalls and sources of power should not be used to fill gasometers with the separate or mixed gases oxygen and hydrogen, and then these led, like ordinary gas, to produce the brilliant oxy-hydrogen lime-light, or in some cases to produce for useful purposes the intensely hot oxy-hydrogen flame. Lighting by this method did not labour under the great disadvantage of being difficult to subdivide, and from some rough calculations which he had made, he considered that when the source of power was running to waste at any rate, it would be economical."

GLASGOW AND THE ELECTRIC LIGHT.—At a meeting of the Glasgow Town Council, held on the 5th inst., a proposal to apply to Parliament to "vest the corporation with the exclusive right and privilege of manufacturing and supplying electric light to the inhabitants of the city and suburbs," and in connection with this, to modify the stipulation in the Gas Act as to the illuminating standard of gas, was carried by 28, as against 6 votes for an amendment for delay.

THE ELECTRIC LIGHT IN THE PARIS OPERA HOUSE.—A gala performance has been recently given at the Paris Opera House, with the co-operation of all the eminent electricians now in Paris, in order to test various methods of applying the electric light to the building. The President of the Republic and all the Ministers of State were present, as well as a large number of distinguished visitors. The experiment was incomplete, as the arrangements for the whole building could not be finished in time. Seventy-two Jablochkoff centres were placed below the ceiling round the upper frieze. The steam engines and the electric generators are placed in the opera vaults. The conductors are inclosed in a double lead envelope to guard against any accident that may occur from breakage of the wires and from the high temperature that may be induced by excessive tension. At a second experiment of the electric lighting it was anticipated that the whole house would be lighted by electricity, and much disappointment was therefore expressed at finding gaslight everywhere. The staircase, auditorium, and *foyer* were all more or less lighted in the customary way, the Brush, Swan, and Edison electric lights being but partially employed. The only parts exclusively lighted by the new method were the small saloons at the end of the *foyer*. Not a few visitors expressed themselves decidedly against the electrical system. The light was stated to have an unfavourable effect upon the gilt decorations and bronze work of the house, and it caused the projections to throw shadows of an unsightly length.

THE ELECTRIC LIGHT IN ITALY.—The *Perseveranza*, of Milan, says:—"The President of our Chamber of Commerce has requested Mr. James Shepherd, during his visit to Paris to the Electrical Exhibition, to study, in name of the Chamber, the new applications of the electric light to industries, persuaded that the observations of Mr. Shepherd, whose knowledge in this science is well known, will be to the great advantage of our industries. We feel sure that Mr. Shepherd will fulfil in every way this charge." Mr. Shepherd has also been specially delegated by the Societa d'Incoraggiamento per le Arti e Mestieri, of Milan, to obtain the necessary material (machines and lamps) for a new series of lectures on the electric light, to be held next winter.

New Patents—1881.

4234. "Treatment of india-rubber and of products made therefrom" (coating wire with india-rubber). H. J. HADDAN. (Communicated by U. Kreusler and E. Budde.) Dated September 30. *Complete.*

4420. "Improvements relating to telephone and telegraphic apparatus and circuits." S. PITT. (Communicated by W. R. Patterson and C. C. Scribner.) Dated October 11. *Complete.*

4421. "Apparatus for use upon telephone wires." G. PITT. (Communicated by E. C. Buell.) Dated October 11. *Complete.*

4428. "Telephonic apparatus." A. R. BENNETT. Dated October 11.

4439. "Incandescent electric lamps." J. JAMESON. Dated October 12.

4448. "Electro-magnets for telephonic and other purposes. J. IMRAY. (Communicated by J. Milton Stearns.) Dated October 12.

4450. "An improved method and apparatus for effecting telephonic communications." J. IMRAY. (Communicated by J. Milton Stearns.) Dated Oct. 12.

4454. "Improvements in instruments for measuring electric currents partly applicable to thermometric regulators." J. T. SPRAGUE. Dated October 12.

4455. "Construction of secondary batteries, or apparatus for effecting electrical storage." J. W. SWAN. Dated October 13.

4472. "A new or improved electric meter or apparatus for measuring and registering the quantity of electricity passed through a conductor." C. V. BOYS. Dated October 13.

4473. "Pneumatic signalling apparatus for railway trains." C. D. ABEL. (Communicated by P. Rimacheosky and W. Tagaitschinoff.) Dated October 13.

4478. "Electric lamps." R. HARRISON. Dated October 14.

4496. "Regulators for electric-motors." J. H. JOHNSON. (Communicated by La Société Anonyme, la Force et la Lumière Société Générale d'Electricité.) Dated October 15.

4504. "Electric arc lamps." J. BROCKIE. Dated October 15.

4507. "Insulators for telegraph and other wires." A. E. GILBERT. Dated October 15.

4508. "Improvements in or connected with apparatus or means for the production, collection, or storage and distribution of electricity, parts of which improvements are also applicable to other similar purposes." J. H. JOHNSON. (Communicated by E. H. Parod.) Dated October 15.

4518. "Apparatus for driving or operating sewing machines by electricity." H. H. LAKE. (Communicated by J. J. Journeaux.) Dated October 17.

4533. "Electric lamps." R. R. GIBBS. Dated October 18.

4541. "Improvements in the generation, collection, and distribution of electro-magnetic currents, and in the apparatus employed therein." R. KENNEDY. Dated October 18.

4544. "Manufacture, treatment and application to various purposes of hyponitric, anhydride and apparatus therefor. (Lights for optical telegraphs, &c.) E. TURPIN. Dated October 18. *Complete.*

4552. "Dynamo or magneto-electric machines." P. JENSEN. (Communicated by T. A. Edison.) Dated October 18.

4553. "Method and means for charging and using secondary batteries." P. JENSEN. (Communicated by T. A. Edison.) Dated October 18.

4559. "Apparatus for generating and utilising electricity." T. M. NEWTON. Dated October 19.

4571. "Measurement of electricity in distribution systems." E. G. BREWER. (Communicated by T. A. Edison). Dated October 19.

4576. "Meters for measuring electric currents." E. G. BREWER. (Communicated by T. A. Edison.) Dated October 19.

4582. "Improved means of supplying electricity for lighting purposes in railway and other carriages and steam-boats." A. M. CLARK. (Communicated by J. de Changy née de Deyn.) Dated October 19.

4591. "Mode of generating electricity." H. J. HADDAN. (Communicated by G. Dessaigne.) Dated October 20.

4592. "Improvements in apparatus for generating electricity, and for the production of electromotive power, parts of which improvements are applicable to other purposes." A. MILLAR. Dated October 20.

4607. "Magneto-electric machines." H. F. JOEL. Dated October 21.

4617. "Electric lamps." A. M. CLARK. (Communicated by H. B. Sheridan.) Dated October 21. *Complete.*

4632. "Construction of secondary batteries." J. STELLON. Dated October 22.

4641. "Improvements in targets and in electrical indicating apparatus chiefly designed to be used in connection therewith." W. R. LAKE. (Communicated by A. Boivin.) Dated October 22.

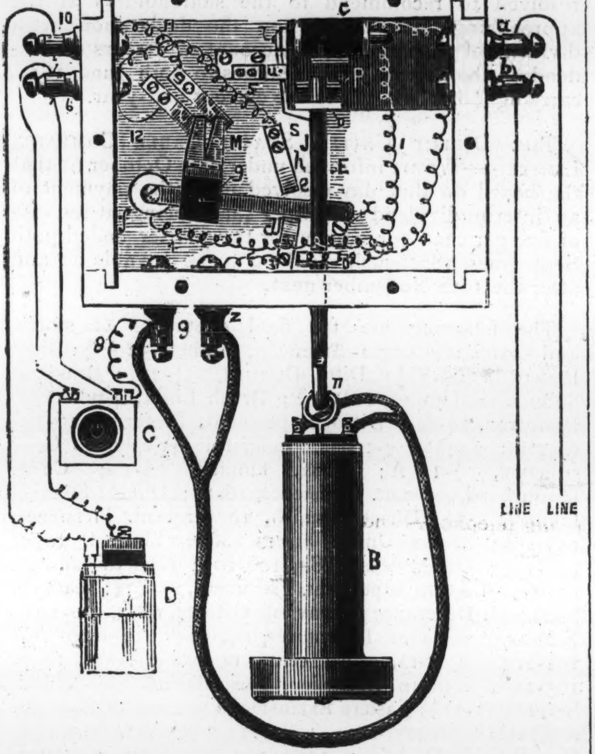
4654. "Electric incandescent lamps." G. G. ANDRE. Dated October 17.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1881.

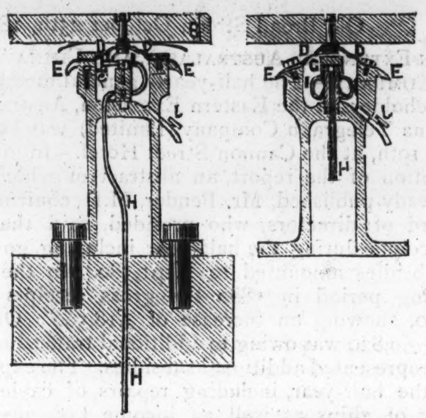
417. "Railway signalling apparatus." JOHN NEVIL MASKELYNE. Dated Jan. 31. 2d. The object of this invention is to provide simple and efficient means for working the distance and other signals on railways, whereby the stretching and contracting of the wires or rods used for that purpose (whether such variations in the length of the wires or rods be due to atmospheric changes or to other causes) will be compensated for. (Void by reason of the patentee having neglected to file a specification in pursuance of the conditions of the letters patent.)

663. "Telephonic apparatus," &c. P. M. JUSTICE. (A communication from abroad by Homer Rice Miller, of America). Dated Feb. 16. 1s. Relates to electric speaking telephones and to signalling mechanisms adapted to be used therewith. The first includes locking mechanisms whereby the operator at any given station may lock out all the stations in the line excepting his own and that with which he desires to communicate. The second part includes an improved electric signal specially designed to be used in connection with electric speaking telephones, but also capable of independent use. The first part of the invention is shown by the figure. In this arrangement the circuit of the transmitter battery is made or broken by the movement of the prongs, *i*, caused by the movement of the switch lever, *e*, which action is necessary when the ordinary Leclanché or a like battery is used with the transmitter. The free end of the lever, *e*, extends through a slot (indicated in dotted lines) in a vertical rod, E. This rod has a hook on the lower end, on which is hinged the telephone (B), and passes through guides, O, O, fixed to the frame. The rod is supported upon a spring, *p*, which rests on the upper guide piece, O, and bears underneath a pin in the end of the rod. The slot in the rod, E, is wider than the switch bar, and allows the spring, *p*, to lift the rod slightly without moving the lever. The tension of the spring is such that the weight of the telephone, B, will depress the rod so as to bring the notch, J, in said rod opposite the end of a bent lever, S, the end of which is fitted to engage with the notch, and lock the rod so that it cannot be pushed up. The armature of the magnet, *t*, is attached to the upper end of the bent lever, S, the lever being so pivoted upon the arm in the case, that the armature when drawn up shall throw the lower end of the lever out of connection with the notch, but when not drawn up, the armature shall fall back by gravity and throw the end of *s* into connection and lock the rod so that it cannot be

raised. It will be understood from this description of the parts that the magnet, *c*, at every station in the line is in the main line circuit. Under ordinary conditions of the circuit, and when no telephones are switched in, the effect of a current is to keep the armature, *t*, drawn up and the rod unlocked. But when an operator at any given station is called, he unhooks and shunts in his telephone. The great resistance of the telephone then brought into the line so weakens the current that it will no longer act upon the electro-magnet, *c*, sufficiently to draw up the armature, and these armatures in the whole circuit of the line will therefore fall back by their own gravity and lock all the rods through which the shunting devices are operated, excepting that from which the telephone has been removed. This happens of course at the station which has been called, where the operator, having removed the telephone, the rod, E, is lifted by the spring, *p*, sufficiently to raise the notch above the catch without disturbing the shunting lever, *e*, as that moves in the slot. The operator at this station may push up the rod, E, and shunt in his telephone, and is thus able to communicate with another station without liability of interruption by the operator at any other station, or that the communication will be heard except at the two stations in connection. By pushing up the rod, E, the shunting lever, *e*, is lifted so that it leaves the point, *d*, and is moved upon the point, *h*, on which it is held by friction. At the same time the points of the plate are shifted so as to inclose the points, *l* and *k*. This movement of the lever from *d* to *h* shunts in the telephone, and that of plate, *i*, closes the circuit of the local battery.



783. "Electrical conductors." J. PERRY and W. E. AYRTON. Dated Feb. 24. 8d. The invention is designed for the better and more convenient insulation of the electric conductor for the transmission of power in electric railways, and for furnishing an automatic block system without the use of signalmen, and further by that method of insulation to give an easy and simple indication of the position of a train or carriage at any point of its travel, or simultaneously of any number of trains or carriages, and thus to furnish a simple means of electric warning throughout the line. For this purpose the insulated conductor conveying the current is divided into sections fairly well insulated from one another and from the earth, so that leakage to the earth of the current which propels the train can only take place from that section or sections of the rail which are at any moment electrically connected with the continuous insulated conductor. In figs. 1 and 2,



A B is a copper or other metallic rod resting on the top of and fastened to a corrugated tempered steel disc, D, D, which is carried by and fastened to a thick ring, E, E, made of insulating material, either by a metal ring or by six screws and washers. The insulating ring is itself screwed to the top of the circular cast-iron box which latter is fastened to the ordinary sleepers by wooden or iron pins or screws. The rail, A, B, and the corrugated steel discs, D, D, have sufficient flexibility that two or more of the latter are simultaneously depressed by an insulated collecting brush or roller, carried on one or all of the carriages composing the train, or on the single carriage if there be not more than one. Depressing any one of the corrugated steel discs brings the stud, E, which is mechanically and electrically connected with the rod or rail, A, B, into contact with the stud, G, which is electrically connected with the main insulated cable previously referred to, or with one of them if there be more than one. This connection is made either by means of a gutta-percha or other insulated wire, H, H, H, or by H, H, being the main cable itself brought up into the box. To prolong the contact the stud, G, is supported by a spiral spring, as shown in the drawing, so as to be depressed somewhat by F. In the neighbourhood of a train the rail, A, B, is then electrically connected with the well insulated cable or conductor at two or more points or contact boxes, and the train receives electric power through the brushes or rollers under the carriages or under some of them, and the current after passing through a suitable electro-motor on one or all of the carriages, returns by means of one or both of the ordinary uninsulated rails of the line, good electric contact between the successive pieces of rail forming the ordinary permanent way and used as the return wire, being insured by pieces of flexible wire being attached if necessary in addition to the ordinary fish plates.

803. "Dynamic apparatus and motors, &c." RICHARD WALLER. Dated Feb. 25. 10d. The improvements in batteries consist in giving a rotary motion to plates of zinc or copper, zinc or graphite, or any suitable materials, immersed in any of the well-known fluids used in batteries. The improvements in motors consist in placing the armature between two magnets, as usual, but instead of being equidistant

from the poles, it is placed so that it is always in contact with one limb of each of the magnets, between which it has an alternate or reciprocating motion, the upper end being at a distance from these magnets regulated by the length of stroke it is desired to obtain.

City Notes.

Old Broad Street, October 25th, 1881.

EASTERN EXTENSION, AUSTRALASIA, AND CHINA TELEGRAPH COMPANY.—The half-yearly general meeting of the shareholders of the Eastern Extension, Australasia, and China Telegraph Company (Limited) was held on October 19th, at the Cannon Street Hotel. In moving the adoption of the report, an abstract of which has been already published, Mr. Pender, M.P., chairman of the board of directors, who presided, said that the gross receipts during the half-year including government subsidies amounted to £191,580. In the corresponding period in 1880 the gross receipts were £173,020, showing an increase of £18,560. Of this increase £9,820 was owing to additional traffic, and the balance represented additional subsidies. The expenses during the half-year, including repairs of cables and expenses of ships as well as income tax, absorbed £55,230 against £50,384 for the corresponding half-year, showing an increase of £4,846, which was caused by the additional expense requisite for renewals of cables and the maintenance of ships, by additional income tax, and by contributions to the staff insurance company. From the balance of £136,350 had to be deducted £41,595 for interest on debentures and contributions to sinking funds, for redemption of the Australian Government subsidy and Manilla debentures, leaving £94,755 as the net profit for the half-year, as against £95,535 for the corresponding period. This was a decrease of £780. Out of the half-yearly revenue, however, £13,295 had been set aside for the redemption of the Australian Government subsidy and the Manilla debentures, and £2,500 for interest on the Manilla debentures. Only for these special charges, the net revenue would have been at least £14,000 more than it had been. An interim dividend had been already declared of 1¼ per cent. It was now proposed to distribute another dividend of the same amount, together with a bonus of 1s. per share, payable that day. This would make a total dividend of 3 per cent. for the half-year, after paying which they would carry forward £34,830. There was one paragraph in the report to which he desired to draw special attention. He alluded to the one informing the shareholders that the Singapore-Batavia cable had for some time past been a source of anxiety, owing to the increasingly numerous and costly repairs which had been necessary to maintain the line in working order. The directors had decided to replace it with a brass ribboned cable, 580 miles in length, designed to resist the attacks of a marine insect called the teredo, which had been very destructive to the old line. The chairman produced some of the cable after its interior had been scooped out and rendered positively useless by the insect referred to. A satisfactory arrangement had been entered into with the Telegraph Construction Company to carry out the work and pick up existing cable for £95,000, which it was proposed to pay out of revenue by instalments. It was hoped that by this means a large annual saving would be effected on the cost of repairs, and that by the arrangement made for payment of the new cable the dividend to the shareholders would not be interfered with. From £7,000 to £10,000 had been lost during the past three years by the ravages of this little insect. He hoped that when next he met them—six months hence—to be able to report that the new cable was laid, and that the old one had been taken up and repaired in such a way as to render it proof against the ravages of the teredo. It was with much regret that the directors had to report the death of their colleague, Colonel Glover, who had been in the service of the company since its formation, and who was generally esteemed and prized. Mr. W. N. Massey, M.P., vice-chairman, seconded the motion for the adoption of the report, and it was agreed to unanimously. A vote of regret at the loss of Colonel Glover and sympathy with his widow and family, proposed and seconded by shareholders, concluded the proceedings.

THE WEST INDIA AND PANAMA TELEGRAPH COMPANY, LIMITED.—The board of this company has resolved to recommend to the shareholders at the approaching general meeting the declaration of a dividend of 3s. per share on account of arrears of dividend on the first preference shares to 30th June, 1881, carrying £8,708 8s. 2d. to the current half-year.

THE DIRECT UNITED STATES CABLE COMPANY, LIMITED.—We are informed under date October 21 that the board on that day resolved upon the payment of an interim dividend of 5s. per share, being at the rate of five per cent. per annum for the quarter ended 30th September, 1881, such dividend to be payable on and after the 16th November next.

The following are the final quotations of stocks and shares:—Anglo-American, Limited, 52-52½; Ditto, Preferred, 80½-81½; Ditto, Deferred, 23¼-23¾; Brazilian Submarine, Limited, 11⅛-11⅜; Brush Light, 4 per cent. Preferred, 7¾-8¼; Ditto, 10 per cent. Preferred, 16-17; Electric Light, ¾-1; Consolidated Telephone Construction, ¾-1 A; Cuba, Limited, 9½-10; Cuba, Limited, 10 per cent. Preference, 16-17; Direct Spanish Limited, 5-5½; Direct Spanish, 10 per cent. Preference, 14½-15½; Direct United States Cable, Limited, 1877, 10½-10¾; Debentures, 1884, 100-103; Eastern Limited, 10-10¼; Eastern 6 per cent. Preference, 13-13¼; Eastern, 6 per cent. Debentures, repayable October, 1883, 100-103; Eastern 5 per cent. Debentures, repayable August, 1887, 101-104; Eastern, 5 per cent., repayable Aug., 1899, 105-108; Eastern Extension, Australasian and China, Limited, 11-11¼; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 108-111; 5 per cent. Australian Gov. Subsidy Deb. Scrip, 1900, 102-105; Ditto, registered, repayable 1900, 102-105; Ditto, 5 per cent. Debenture, 1890, 102-105; Eastern and South African, Limited, 5 per cent. Mortgage Debentures, redeemable 1900, 102-105; Ditto, ditto, to bearer, 102-105; German Union Telegraph and Trust, 10-10½; Globe Telegraph and Trust, Limited, 6½-6¾; Globe, 6 per cent. Preference, 12½-12¾; Great Northern, 11¾-12¼; 5 per cent. Debentures, 103-105; India Rubber Company, 28-29; Ditto, 6 per cent. Debenture, 103-105; Indo-European, Limited, 28-29; London Platino-Brazilian, Limited, 4¾-5¼; Mediterranean Extension, Limited, 2½-3; Mediterranean Extension, 8 per cent. Preference, 9½-10; Oriental Telephone, ⅜-½; Reuter's Limited, 11½-12½; Submarine, 290-300; Submarine Scrip, 2⅝-2⅞; Submarine Cables Trust, 97-100; United Telephone, ——; West Coast of America, Limited, 4¼-4¾; West India and Panama, Limited, 1¾-2; Ditto, 6 per cent. First Preference, 7¼-7¾; Ditto, ditto, Second Preference, 6-6½; Western and Brazilian, Limited, 6¾-7¼; Ditto, 6 per cent. Debentures "A," 110-115; Ditto, ditto, ditto, "B," 99-103; Western Union of U. S. 7 per cent., 1 Mortgage (Building) Bonds, 125-130; Ditto, 6 per cent. Sterling Bonds, 104-107; Telegraph Construction and Maintenance, Limited, 26-27; Ditto, 6 per cent. Bonds, 104-108; Ditto, Second Bonus Trust Certificates, 1⅝-1⅞.

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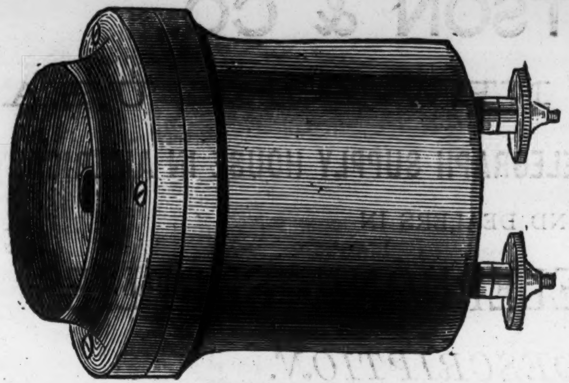
TO OUR ADVERTISERS.

For this Number a few Special Advertisements will be received for Whole and Half Pages only; orders for these will be accepted on moderate terms, which can be had on application to the Manager. An extra circulation, in addition to the normal one, is already guaranteed.



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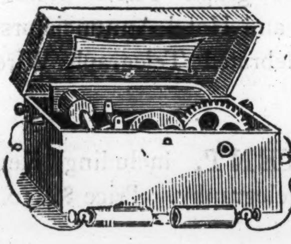

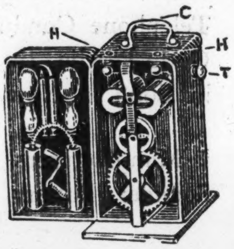

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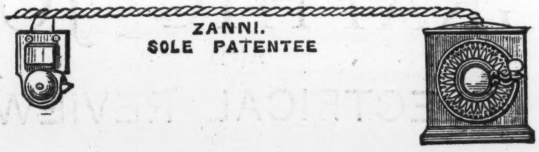

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Men who work hard as I do, not muscular hard work, but that which is quite as exhausting, viz., brain work, very often experience the need of, and have sometimes an almost irresistible craving for, a "pick me up," and very often the panacea for a time for lassitude, and that state of mind which renders work irksome, are alcoholic stimulants, the use of which must sooner or later end disastrously.

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Thorpe Hamlet, Norwich, Yours faithfully,
February 23rd, 1881. O. D. RAY.

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Queen's Crescent, Haverstock Hill,
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I am now giving it to my son, twelve years of age, whom we have always thought consumptive, and from a puny ailing boy he seems to be fast growing into a strong healthy lad.

Inclosed you have cheque. Please send me two dozen of the "Extract." With thanks for your prompt attention to my last.

Yours truly, I am, Sir,
GEORGE A. TYLER.

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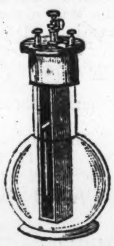
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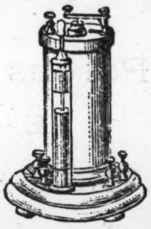
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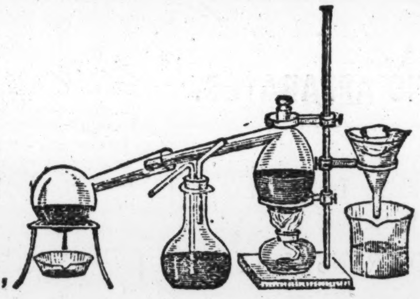

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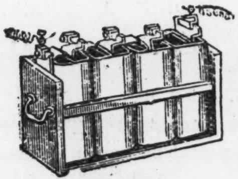
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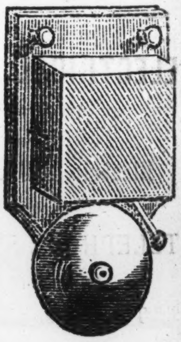
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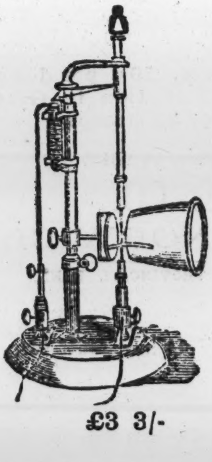
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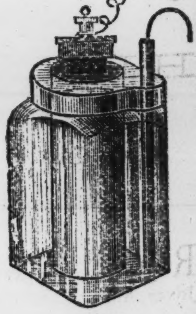
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